[0034] The above-mentioned problems were solved in the present invention based on aforementioned facts.

(1) A rotating shaft piercing the center of a cross-flow fan is mounted in a cross-flow fan for a discharge excitation gas laser.

(2) A hollow section is provided within the rotating shaft in (1).

(3) When the outer diameter of the cross-flow fan in (1) and (2) is taken as D and the diameter of the rotating shaft is taken as d, the relationship would be $d/D \geq 0.13$.

[0038] The inherent oscillation frequency of a cross-flow fan can be raised by setting $d/D \geq 0.013$ as indicated in (3) above, and resonance can be eliminated even at maximum rotational speed exceeding 4000 rpm.

[0043] Furthermore, Figure 3 shows the magnitude of vibration of a laser chamber to which a fan is attached. In the diagram, the abscissa represents the speed of rotation (rpm) of the fan while the ordinate represents the vertical vibration acceleration (m/s^2) within the chamber. The diagram shows the characteristics of a conventional fan (curve 1) that lacks a piercing rotating shaft and a fan of this embodiment that has a piercing rotating shaft (curve 2). The fan has diameters D = 120 mm and d = 23 mm with a 600 mm length in the axial direction. In addition, the conventional example was identical with this embodiment other than for the fact that the rotating shaft did not pierce the fan interior. As indicated by the results shown in Figure 3, the vibration acceleration could be reduced by about ½ as compared to the conventional example.

In the past, as explained above, no problem arises if $d/D \leq 0.07$, taking rotating shaft diameter as d and fan outer diameter as D, when a rotating shaft is mounted within a cross-flow fan. Specifically, adverse effects result if $d/D \leq 0.07$, but the gas flow rate does not change from that of a conventional fan even if a central shaft of $d/D = 0.19$ is mounted in aforementioned embodiment under conditions of low flow rate and high head as in a laser chamber.

[0045] Thus, the diameter d of the rotating shaft was computed for the case in which the axial length of a cross-flow fan is equal to the electrode length of an excimer laser so that the inherent oscillation frequency would exceed 95 Hz. For example, the following would